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122 [113] Simultaneously with the appearance of this book, Professor Vogel is publishing his results in the organ of the Gesellschaft für Erdkunde zu Berlin/Geographical Society of Berlin/ which deserves credit in connection with our journey for supporting him from the funds of the Karl Ritter Foundation. I cordially thank the president, Privy Councilor Baron von Richthofen, for his kind permission to add to my account the map drawn and edited by Dr. Richard Kiepert's trusted hand. I myself experienced substantial assistance through the Humboldt Foundation of the Königlich Preussischen Akademie der Wissenschaften zu Berlin /Royal Prussian Academy of Sciences of Berlin/, and on this occasion, too, I beg the Board of Trustees to accept my most sincere gratitude.

In the course of the journey we were given numerous demonstrations of hospitality by Brazilians as well as by countrymen in Brazil and the La Plata states, both by simple private persons and by persons in high office, who have put us most deeply under obligation to them. Though we can show our appreciation to the sons of the country to a certain extent by helping to open up the interior of a little explored province, we remain wholly indebted to our countrymen. were I merely to mention the localities where they live, I would have to recapitulate the entire route, except for the Indian paths. Thus, to all to whom these lines find their way, whether they import and export in trade or lead in a political position, or whether, as intrepid colonists, they live far from the coast, I extend the most cordial greetings and wish them the safeguard of peace and orderly conditions for their work.

128 [802] [113] The maize has already bloomed six times since we left the source region of the Schingû -- "two two two, ahâge ahâge ahâge," counts the Bakaïrí, and finds no words in his language to express a larger number. The report has been delayed longer than I liked: I was held back primarily by preliminary linguistic studies (Die Bakaïrí-Sprache /The Bacairi Language/, K. F. Köhler, Leipzig, 1892), but I learned many things from them and gained a broader and firmer foundation than was the

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823 805 [539] norõku, põne, it is now -- as though we were to say "Jahre" /the German word for "years," but with the accent on the final syllable/ -- transferred to the last one "norokũ," "pone," and the arrow flies, tsök, tsök, from the bow.

Beyond the Nahuquŝ, however, where the knowledge of details becomes vague, only the days' journeys themselves are given. The right hand, slowly rising in even motion, describes an arc from east to west, arrives down there, and suddenly is laid on the cheek coming up to meet it, remains there while the eyes are wearily closed, and then grasps the little finger of the left hand: sleep once. Then again the same figure, but the ring finger is grasped with the little finger and both are drawn aside: sleep twice, and so forth. Be attentive, noble listener, for woe to you if you ask a question -- there is no other way to help you but to begin again from the beginning.

123 But revenge is sweet. My turn also came, for they wanted to know how far it is to Cuyabŝ, my starting point. Their faces • [802] were priceless when I counted off, first, the fingers of my left hand, then my right, then, exactly according to their method of counting, went over the toes of the left foot and those of the right, traveled and slept between each two fingers and each two toes in the prescribed way, and finally had to grasp my hair, pulling it apart, to demonstrate that the number of days still did not extend far enough and was more than 20! Then they murmured their "kõu, kõu" of amazement or "õko, õko, he õko" more and more impatiently; all talked at once and finally joined in the hearty laughter of sheer disbelief.

186 /71/ Individual Indian tribes were also ridiculed in vivid pantomime on account of their peculiarities; the Nahuquŝ were funny because of their beards, the Suyŝ, or, as the Bakaïrĩ say, Schuyŝ, had to bear the brunt because of their cork-disk which they wore in the lower lip, for which the actors stretched their lower lip far forward and produced a made-up jargon of snapping tones; the Trumaĩ were imitated with a horrible "huhuhuhu" and, because of their barbaric habit of tossing war captives into the river with their hands tied behind them, were presented as objects partly of scorn or disgust, partly of fear.

/270 cont./

000 Civilized man today begins even his first bungling efforts in the drawing art with triangles, squares, circles, and with these and similar figures our ancestors developed the science that is regarded as the highest; he does not see lines and geometric figures anywhere around him in nature -- therefore, he concludes, these fundamental concepts have sprung from his own rich inner self. That they could have originated from the models of pubic coverings, bats, or fish seems to him not only unworthy, but also a ridiculously roundabout course. For what is simpler than drawing a triangle? What is simpler, I reply, than counting to five? Even now the Bakairí explains each triangle that I draw for him as a picture of the uluri. he cannot yet count things without the help of his fingers. The number word "5" = hand, which is still found among many primitive peoples, corresponds exactly to the uluri - triangle. in both cases the inner perception of the pattern or the abstraction is derived only from the object, in both the concrete original has asserted its rights for a long time. Neither the facility with which we toss these ideas about nor the fact that the meaning of our number words has evaded all the probings of philology proves that our ancestors followed a course different from that of primitive peoples.

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The teacher of geometry today certainly need not take particular pleasure in an uluri in order to sketch a triangle. The uluri is a sort of archaeopteryx of mathematics. How should the flying bird appreciate the fact that it is descended from the creeping or, at best, fluttering reptiles? Nevertheless the bird's inability to understand this origin does not prove the least thing against it. In the same way nothing is proved if we who are excellent flyers in the heights of mathematics can scarcely imagine that earlier human beings were unable to rise to the minor achievement of producing a simple triangle by themselves.

Use of the ornamentation. On the weapons used -- there were only bows and arrows -- painted designs were scarcely applicable. The throwing stick, too, was decorated only with plaiting around it; a cork cone that was mounted on an arrow shaft as a tip exhibited the decoration of the mereschu design, cf. the illustration, page 91.

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a whole into its halves. Objects furnish the empirical limit of the "2" gesture. Dependence on sense of touch. Confirmation by etymology.

B 171 802 [128]

The art of counting was the least developed among the Bakaïrí /Bacairi/. With regard to the other tribes I shall limit myself to a few remarks, since I am giving the numbers in the word list /omitted in the translation; see the foreign text, pp. 524-547/.

B 171 802 171 802

All tribes counted the fingers of both hands first and then the toes of both feet. With the exception of the Bakaïrí, they commenced with the thumb of the right hand, counted up to 5 on the fingers, went over to the thumb of the left hand, counted up to 10 here, and repeated the procedure in exactly the same way for the feet.

If one regards the number words in terms of their formation, one observes among all the tribes that they have separate words for 1, 2, 3, with the exception of the Bakaïrí, whom I shall ignore for the time being, and the Trumaí, for whom, however, the records contain much that is uncertain; among the Trumaí the word for 2, hurs, is contained in the one for 3, hurstamé. On the other hand, the Trumaí and, besides them, only the Waurá (uncertain) and the Kamayurá /Camayura/ have an entirely new word for 4, whereas among all the others 4 is represented by 2 altered by an addition.

For 5 the Trumaí and the Auetó have a new word that has nothing to do with "hand." Among all the others, always with the exception of the Bakaïrí, "hand" is contained in the 5. The Kamayurá say "hand stops," yenepó momáp (Guaraní mombáb, to stop), the potter tribes say "1 hand," the Nahuquá simply "hand."

The numbers 6, 7, 8, 9 are formed out of 1, 2, 3, 4 with an addition. It is only among the Kamayurá that the latter is different for 6 and 7 than for 8 and 9. For 6 and 7 = 1 and 2 + verowák, the meaning (Guaraní guerobág) seems to be: 1 or 2 are interchanged, alternate.

/406/ Among the potter tribes and probably also the Auetó 10 contains the hands, among the others the word is a new one.

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B 171 802 T 171 802 With 11, among all of them, the foot enters, specified by an addition, and 12, 13, 14 are = 2, 3, 4 + foot and this addition. The Nahuquá, however, instead of their word for foot, use the word vũro, which, however, from a comparison with other Karaiben /Carib/ languages, is recognizable as a stem with the same meaning,* and now count from 11-15: "1, 2, 3, 4, 5 foot"

* vuro = upu-lu (-lu pronominal suffix);
Makusí, Island Karaiben, upu, foot.

on the right toes and from 16-20 on the left "1, 2, 3, 4, 10 foot."

From 15-19 matters are very confused; with 15 a new addition usually appears and the formations run parallel to those of the second hand from 6-9 or those of the first foot from 11-14. Among the Yaulapiti, whose numbers are formed very regularly, 1 foot means 15, whereas among the Mehinakũ /Mehinacu/ 11, in the former instance because the foot is finished, in the latter because it is just beginning. Thus, among the Mehinakũ, the following oddity occurs: 5 = 1 hand, 11 = 1 foot, 12 = 2 foot, 13 = 3 foot, 14 = 4 foot and (since 5 = 1 hand) 15 = 1 hand, foot!

All have the feet in the 20 except the Auetó. Among the Yaulapiti the same addition which was with the hand = 10, is with the foot = 20. Among the Kustenaũ /Custenau/ 15 is precariously similar to 20.

B 802 Let us now turn to the more backward Bakairí, with whom I practiced all kinds of arithmetical exercises.

The names of their counting apparatus, the fingers, have nothing to do with numbers. The thumb means "father"; the little finger, "child" or "little one", the middle finger, as among us, "the middle one"; index finger and ring finger are called the "neighbor" -- at least that is the probable meaning -- in the case of the former, of the "father," and, in the case of the latter, the "neighbor" of the "little one."

They count in words up to 6:

1 = tokále	4 = ahége ahége
2 = ahége	5 = ahége ahége tokále
3 = ahége tokále or ahewão	6 = ahége ahége ahége

As may be seen, they have individual words only for the numbers from 1 to 3, and the numbers from 4 to 6 are made up out of ahége and tokále. It was only on the second expedition

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802 that I learned the word ahewáo for 3, but I just as frequently heard the form made up of 2 and 1. The inference that ahewáo is perhaps a newer word would be false, for linguistic comparison shows that it is also present among several Karaiben tribes in the northern part of the Amazon River and must be very old. It is noteworthy, however, that this 3 does not enter into any of the higher number words, not even 6.

If we disregard the nonobligatory ahewáo, the Bakaïrí counts as follows:

one, two, two-one, two-two, two-two-one, two-two-two.

He starts with the little finger of the left hand and says "tokále," grasps finger IV, joins it with V and says "ahége," goes over to III and says, /407/ holding it separately beside V and IV, "ahége tokále," goes over to II, joins it with III and says "ahége ahége," grasps the thumb and says "ahége ahége tokále," places the little finger of the right hand alongside it and says "ahége ahége ahége." Beyond "6" the Bakaïrí has come to the end of the number words and now continues with IV, III, II, I of the right hand by touching each finger in turn and simply adding "méra," "this one." In like manner he touches the toes of the left and right foot and each time says "méra." If he is still not finished, he grasps his hair and pulls it apart in all directions.

One is obliged to say to oneself that if they had wanted to designate 7 with "ahége ahége ahége tokále," they would have had to count, and in order to count they would have had to count the numbers themselves. Thus, even if there were no more profound reasons, the lack of a number word higher than 2 or 3 would have been an obstacle in itself. Apparently beyond 6 they had only a vague idea of a larger sum. One must imagine someone who wants to count the steps of stairs, but on the way, for some reason, no longer knows exactly the number of steps covered; climbing higher and higher, he remains aware of the fact that there are always more, but having once lost count, he becomes increasingly vague about how many more steps there will be and how many there are altogether. Thus the Bakaïrí climbed their stairs of 20 steps up to the end and were undoubtedly

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802 altogether sure that with the first foot they were farther than with the second hand, and with the second foot farther than with the first, but after they had counted, say, 10 fingers and 5 toes, there was no question of their having a precise notion such as we associate with the word "fifteen."

Their concepts came to an end with "6," and the view beyond "6" was likewise definite only to a certain degree, as long as it was bound up with seeing and feeling the fingers and toes. As soon as specific objects were to be counted, their skill scarcely went further than their concepts, that is to say, the number words.

125 802 I made a great many experiments with Paleko and Tumayaua -- I tear my hair at the memory -- and shall first mention the invariable result with a large number of maize kernels or something similar. If I put down ten kernels and asked "åtúra?" "how many?" they counted, in the manner to be described, slowly but correctly up to "6." At the seventh and eighth kernel they would, if necessary, refer to fingers IV and III of the right hand and correspondingly say "méra," "méra," but then they acted tired and morose; they reminded me of people who are supposed to play cards or solve puzzles in which they are not interested and soon exclaim, yawning: "Oh, I have no talent for that sort of thing." They, too, yawned, and, when I pressed them, they laughed foolishly or made a sullen face, complained of "kinarách u ewáno," which, significantly, means "head-work" or "head-pain," and, if possible, ran away; in any case they went on strike.

802 /408/ On one occasion I asked Paleko whether the Nahuquá village was large. In reply he set about drawing a number of circles in the sand and pointed to the picture with a satisfied expression. His purpose was to illustrate for me the indefinite multiplicity of houses, the more precise number of which he could scarcely have had any certain knowledge, and he was not in the least aware that, putting down one circle after another he was nevertheless giving me a limited number. Paleko had no idea of the fact that there are people who can specify a dozen circles as 12 circles.

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125 How did they count things that did not exceed 6 in number?
802 If I put down 1 maize kernel, the Bakaïrí immediately answered "tokále," at the same time generally grasping the kernel and then the left little finger, but both so hastily and mechanically that, even if he did so, the process seemed needless. In the case of 2 kernels, he seldom omitted taking the fingers of both hands to assist. Particularly if I put down the kernels somewhat apart, he would always shove them together and then always grasp the left little finger and the ring finger before he pronounced the number. If I put down 3 kernels and asked the number, I was not once given the answer, either by Paleko and Tumayaua or others with whom I practiced less, until the little pile had been divided into 2 and 1: they would first touch the pair of kernels, frequently breaking them up, inspecting them, then on the left grasp fingers V and IV and say "ahége"; then they would grasp the single kernel, shove finger III to the left toward IV and V, say "tokále," and finally announce: "ahége tokále." The experiments proceeded in a similar manner up to 6. Little heaps of two kernels were always made, they were always touched, and only then the finger put to use.

The right hand touched, the left hand calculated. To count on the fingers of the left hand simply by looking at the kernels, without using the fingers of the right hand, was utterly impossible even with 3 items. The little heap of two had to be positioned properly with the hand. I placed 3, 4, 5, 6 kernels before Tumayaua, let him form the little heaps, but held his left hand: he would seldom count, or rather guess, correctly with 3; for the remainder he gave a random collection of "ahége" for good measure. Thus, both hands were indispensable when 3 items were to be counted; in an emergency one could do without the left, but never without the right.

801 In the legends and tales of the Bakaïrí, to keep this in mind
802 here, the number 2 is often mentioned.

The 3 also appears; the bagadú fish gives the deer 3 mandioca twigs which he is supposed to plant. Kamuschini cuts down 5 trees; cf. page 445. The storyteller needs 3 sentences in order

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801 to give us this information. "He cut down two pikĭ trees. He
●802 cut down two more the same way. He cut down one."
Kamuschini brings the 5 trees into the house and sets them against a mortar. Again 3 sentences, and, /409/ to be sure, here, in the middle of the enumeration, the second pair of trees is expressed not by the number word "ahége," but by the indefinite "zagóno," the one or the others. Thus, the three sentences run: "He set 2 against the mortar. He likewise set the others against the mortar. The single one was put against the mortar." Of course, the situation in this case need not be quite as bad as it looks. Kamuschini cuts down different kinds of trees, as Antonio also remarked to me. Thus, the storyteller may have had in mind in each of those three sentences the different trees. Nevertheless, he would not have proceeded otherwise with 5 trees of the same species, as I saw in the case of the 5 stars of Perseus; cf. page 425.

802 There is, of course, nothing to prevent them from reporting accurately even in the case of 5 items, since they have number words up to "6."

One of the stereotyped conversations had to do with the number of children. Even the Bakaïrĭ who arrived from the second village and had not yet been tortured by my experiments confided to me during the first quarter hour that they had 1, 2, or even 3 children, and in doing so used their fingers without exception. It seemed unheard-of among the Bakaïrĭ that someone calls "ahége ahége" offspring his own. Hence they got along very well with the number words and the fingers.

In fact, they did not need higher numbers than they possessed. In their simple circumstances, which were not beset with difficult problems about property, a number of pieces beyond six played no role. On their own initiative, they gave me the numbers for the child statistics just mentioned and for the days' journeys on the river, which from tribe to tribe always remained under that limit. Their deficient arithmetic means a lack of intelligence only insofar as it shows, to be sure, a limited economic horizon, but has nothing at all to do directly with poor endowment. It

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●802 means lack of practice. They have no livestock whose numbers they would be obliged to watch, they have no trade in goods that would have to be counted or referred to a unit of value; they need only inform one another now and then about the number of persons, about the number of animals, which they have encountered, which they have killed, which they divided up among themselves, about the trees that they cut, and whatever similar work there is in the household and daily life, for which their number words are adequate or for which an indefinite multiplicity may be conveyed with other means of expression in word and gesture. They have the principle of counting, the abstraction of number; the Karaiben base-people already had this in ancient times, and from there upward the further development depends only on interest. Their limited need for concerning themselves [193] with the number of things is, in my opinion, characterized by the lack of a plural even more than by the lack of number words. Tree, trees, and wood are all "se," house, houses, and village always merely "éti."

800 We whose lives are full of numbers because they represent the framework of all our knowledge possess a great many acquired items of knowledge in which all /410/ ordinary, "regularly" recurring numerical relationships are included, and in very many individual cases we do not need independent observation. It is not likely that we ever counted our toes, but it is true, there are ten of them. We can wear a vest for a year, put it on and take it off daily, and yet have no idea how many buttons are on it. Now primitive man clings to each single phenomenon and knows nothing about laws. If one asks him how many fingers he has he is glad to do us the favor of counting them. He takes the question exactly as the European does the one about the vest buttons.

171 802 How the Bakaïrí art of counting, which is extraordinarily similar to that of Australian tribes, could have developed further step by step can be seen in a frequently cited example among their near, though spatially very remote kinsmen, the Tamanako of the Orinoco. The latter have completed the

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171 802 familiar step forward and chose a number word for "5" from the hand: "whole hand"; "10" are "both hands," "15" a "whole foot," and "20" "a man." The "2," the same word as among the Bakaïrí, is still contained in the "4" of the Tamanako, but they have given it an ending determining the meaning and no longer say "two-two." We again recognize exactly the same finger-gesture system of the Bakaïrí, which, however, has already provided itself with proper number-words.

800 While Paleko plaited baskets or when I often swung sleepless in my hammock during the night, I would rack my brains about their method of counting. Was one to be unable to find even here, where conditions are as simple as possible, any trace of the remarkable secret of how the abstraction of number originated in the human mind?

It has been observed everywhere among primitive peoples that they count primarily with their fingers and get along better this way than with number words. From this general experience it was concluded that number gestures are older than number words and that the latter only came out of the former. Now, in speaking of finger gestures, one must not think that it is merely a matter of gestures with which the number is to be conveyed to the questioner as though they had the immediate purpose of giving him a more vivid elucidation, in the way an Italian, for example, as soon as he says "3," stretches out 3 fingers. The native calculates with his fingers, in the way one grasps the beads on the wires of an abacus. It is true, in counting one or two objects he often touches the fingers of the left hand so fleetingly that the movement takes on the character of a purely communicative gesture. If, however, one has watched the careful and punctilious [802] work which the counting of 3 maize kernels represents, how the Bakaïrí touches first the kernels and then the left fingers, one will not doubt that the left hand is his abacus. And in the same way beyond "6" he touches his fingers and toes one by one like the beads of an abacus, and he is far from pointing to them merely in an expressive way or even, if that were mechanically possible, from stretching them out in pantomimic demonstration.

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000 symbol-seeker will not indulge in the fancy that originally he conceived the first "2" by feeling a pair of eyes or wings and then transferring the sensation to his fingers.

Just as little would he have been able to abstract the "1" as the first number concept from "nose" or "mouth," whereas he could apply it to them after he already had the abstraction. But whether he placed his finger on his nose or his nose on his finger, it would not have helped him in the art of counting, as has been mentioned, for with such 1, 1, 1, 1, which without the "2" would have been no better than the demonstrative "méra" of the Bakaïrí, he would never have arrived at the first sum. His "1" could only have piled up an indefinite "many."

Now if it is not understandable how the numberless man could have made "2" out of 1 + 1, might not the solution of the problem be that he made it out of a single entity?

●802 The Bakaïrí counts, both in his finger language as well as in his word language, according to the following schema:

I, II, II I, II II, II II I, II II II, and, to be sure: I tokále, II ahége.

Although he has a separate word for "3," he uses it only to a limited extent. The "2" cannot renounce its original importance and did not even tolerate the formation of an "ahewáo ahewáo = "6." The objects which are counted are divided into pairs. In the case of "3" and "5," he does not form I II "tokále ahége" and I II II "tokále ahége ahége," but II I "ahége tokále and II II I "ahége ahége tokále." Thus, it looks /413/ almost as though "2" had existed, not only before "3," but also before "1"!

000 This notion led me to the approach which I regard as the right one. This approach must be an everywhere recurrent, lawful and extremely simple process and must speak for itself, no matter what etymology says; it must be of such a nature that we have to take it for granted even when we do not know the number words at all.

Now what if man had achieved the unit "2" by dividing a whole into two pieces? What if, instead of beginning with the "number of pieces" "2" he had begun with the number of 2 pieces?

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802 If there is no natural limit for the "2" in the fingers, and one tribe calculates by beginning from the little finger, another by beginning from the thumb, that of the Coroados even at the finger joints, according to Martius, then the counting of the "2" is not learned by means of a pattern in the arrangement of the hand itself, as would be conceivable with "5." It should be remembered, however, that the Bakaïrí only calculates on the left hand what he has touched with the right. With his glance alone he cannot transfer the number of kernels to his left fingers, but must first arrange them. His counting is divided into two processes: that of the arrangement of the objects into 2 parts and that of the illustration on the fingers of pairs and individual pieces. But he already divides or counts up to 2 on his right hand and simply derives the abstraction, if I may express it thus, on his left hand. The important preliminary step, which, I believe, has been overlooked up to now, comes from the touch perception. Then, of necessity, the things he touched and somehow manipulated with his hands are responsible for the first unit of "2": these things must have in them a law that furnished the concrete "2" when they were manipulated and that with certainty produced the abstraction of "2" after the customary illustration with the fingers, because the same observation was repeated in the case of all objects.

One can break a thing into many fragments, but everything that one methodically breaks or cuts is first broken or cut into 2 pieces. I can take in my hand 1, 2, 3, 4 sticks and nothing teaches me to put the individual ones together in number units, but if I take a stick and break it -- it will be conceded that, as long as man has existed and wherever on earth he has broken sticks, he has always broken every stick first into "2" pieces. If one again breaks the first piece into 2 and the second piece into 2, one obtains the numerical order of the two-system of the Bakaïrí or the Australians. In the demonstration of the procedure regularly following the same course by means of the finger gestures used by primitive peoples for all illustration, the ancient Bakaïrí always pointed first to the little finger and ring finger and then, if he

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000 continued, to the middle finger and ring finger, while the Coroado always pointed to the two upper finger-joints of a finger: here an initial limit was marked off on the fingers, no matter where, but a limit that remained constant in the case of any one people, an empirical limit. This was the finger gesture "2," and the word "together," "finished," "much" -- there are x conventional possibilities --, which concluded the first operation, became the number word "2," and the first operation was followed by a second identical one for 3 and 4.

The conception of "2" was first formed and practiced with fragments. It may soon have been extended to other similar objects which a person had in his hand /415/ and which resembled one another as two fragments resemble each other; in the case of two wholes the two-unit looked and felt the same as in the case of two fragments. 2: (1 + 1) = 1: (1/2 + 1/2). With this advance, it must have been detached from the process of cutting and breaking and transferred to other procedures, such as giving and taking and apportioning, which were done with the hands and in the same way with fragments or wholes.

The activity of dividing was always the same, the objects changed as desired; thus, one came to disregard their nature and had the abstraction of the number "2." But it was only by means of the activity that it was achieved, not by means of the mere appearance of the objects as they represented, say, the paired organs of the body. The first firm basis was now established in experience for the fact that one could divide a whole into two halves without calculation: if one broke a single piece, he no longer had to touch and mark off, he knew that it made "2." In the case of the paired organs, however, it is primarily a matter of the halves of a whole. They were conceived, on the basis of all experience, as a correlated whole, there were no one- or three-eyed, no one- or three-legged human beings, and one had in view, even if it were not precisely defined conceptually, that one had neither more nor less.

•802 The clear initial limit, which we still definitely recognize among the Bakaïrí today, is the division of the whole into its

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802 halves. For as soon as it comes to 3, he requires the assistance, not only of his calculating machine, but also of his sense of touch. Even today he does not know, without reflection, that he has five fingers, although he can count them; his knowledge is secure only as far as "2," as is also shown by the drawings which I had the people make. With any given number of similar objects, he is to this day confronted with an indefinite multiplicity, and that is why, when I place before him for counting 2 maize kernels which are not 2 halves of a whole, he repeats the old procedure and lets the fingers touch them; in this case, to be sure, the Bakaïrí is quite able to count without the fingers, but he seldom does so. With 3 maize kernels he cannot for the life of him say that there are 3 if he simply looks at them and does not also touch them and add 2 + 1 on his left hand.

000 It was only the touch perception that in the beginning marked off the objects that were counted. In order to understand the fatigue of the Bakaïrí, we must imagine that we are counting in the dark and have only the number words 1 and 2. We are so accustomed to count with our eyes that we can scarcely realize that this is an accomplishment achieved only through long practice, which was attainable only with the possession of the higher number-words and by an audible or silent pronunciation of them replacing the finger grasping. And yet we need only take the ears instead of the eyes and we soon realize how everything depends on practice and how in an equivalent sensory area we register or count just about as badly as the Bakaïrí does /416/ the maize kernels. Who does not count aloud or silently when he wants to count the striking of a clock, assuming, of course, that he does not know beforehand how many there will be? And now one should imagine for a moment that he does not have at his disposal a series of number words, each of which relieves us of the effort of remembering the preceding one, but rather has only the words for 1 and 2; will he not immediately use the fingers in order to ask them for the sum at 6 or 8 strokes, exactly as the Bakaïrí does in his case? The fact that one stroke after another dies away does not essentially alter anything in the comparison; I must also move my glance from one object to another.

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000 Conversely, let us imagine someone who has had a great deal of practice in registering aural impressions; will he be able to understand how someone like us could say he heard the clock strike but could not tell how often? How charitably he would smile at our audible counting! And he, too, would have to use his fingers to help out if among his number words he had no higher units than 2 and 3.

[802] Just as we are not practiced in hearing, so the Bakaïrí is not in the habit of counting with his eyes. He is still almost entirely limited to the result of touch perception. The foundation upon which further development, stimulated by interest and need, and the formation of higher units must have been accomplished had already been present for many generations, yet how slight were interest and need in primitive family life! Even in sharing, which -- we cannot help but think -- first of all demands "keeping accounts," one scarcely ever needed to count: it was give and take and the piece in the hand proved more than the fingers on the hand.

802 196 Let us turn once again to the number words of the Bakaïrí and see how their etymology, insofar as it offers any certainty, corresponds to the development revealed in the experiments. The comparison is not without value because the two studies were made quite independently of each other, and the explanation of the number words rests only on phonetic proof and linguistic comparison.

171 802 196 I do not know how to begin with "ahewáo," "3." It occurs among a number of tribes of the north, partly in greatly altered forms which nevertheless can probably be reconciled. The singular luxury of two numerical expressions may be bound up with the great uncertainty which the Bakaïrí still manifest in 3-counting; the important thing is still to determine the pairs and there is a separate word only for what exceeds the designation of the first pair, the most common case. In the difficult counting of objects that exceed "3," I heard only "ahágе tokále," so that the two expressions are used somewhat like "twelve" and "dozen," and "ahewáo" perhaps still has something indeterminate adhering

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171 to it from its original meaning. For this reason it is not used for
802 making up higher numbers. In the Kamayurá "3" is called
196 moapüt, a word that can be definitely analyzed. It is made up of the causative mo-, mbo-, and apüt, apy, "peak," "point." The highest /417/ or peak finger is the middle finger, which marks the "3," in other words, already a natural limit, like 5 = hand. In the closely related Auetö, 1 and 3 are entirely different words than in the Kamayurá-Tupí, while 2 is the same. This is very similar to the relationship among the various Karaiben tribes.

Fortunately, the meaning of the most important number-word "aháge" is certain. It also has the greatest comparative value linguistically, for it occurs, for the most part little differentiated, among all the genuine Karaiben peoples and is a veritable guide-word. Phonetically it goes back to "atáke." It must be broken up into, first, the demonstrative a-, which also forms the pronominal prefix of the second person and refers to the nearest thing outside one's own body, and, secondly, the post-position "-take," "-sake," "-hage," "with /mit/, along with /samt/" = "there-by /da-bei/," "there-with /da-mit/," "together /zusammen/." Thus, there is nothing in it about hand or fingers, and nothing about eyes, wings, and arms.

"Many" is "aági," and even "ági," and, since I also once wrote down "ahági" and in any case there must have been a consonant between the two occurrences of a, was very probably originally identical with "aháge," "2" -- an identity which has long been lost in the linguistic feeling of the modern Bakaïrí. Consequently, the meanings "2" and "many" would have split off from the oldest meaning still demonstrable today, "therewith /dabei/," about like our "jointly /miteinander/" "together /zusammen/," and the word for the definite number and the one for the indefinite amount would be merely phonetic differentiations of the same stem form.*

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* For example, in German the same stem paar /pair/ = "2" and = "einige" /a few/ is not even phonetically differentiated, but only syntactically.

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500 and graphically for the person who writes "Paar" and "par"; even the syntax is not consistently carried out. Because though one says, "das Paar Handschuhe" /the pair of gloves/ or "ein Paar Handschuhe" /a pair of gloves/, one also says, "die par Leute" or "ein par Leute waren da" /the few people or a few people were there/, instead of being consistent and saying "wenige Leute" /few people/ or, likewise without an article, "par Leute waren da."

●802 196 We see that the history of the Bakaïrí number-word for 2 is wholly in keeping with the presumed origin in general of the outlook regarding numbers. We only learn here in addition that the observation of how an object broken with control falls into "2" pieces was not separated for a long time from the one that in the case of an object uncontrollably broken one has in one's hand any number of pieces "together." Now, however, contrary to our psychological development, a strange ray of light falls on the etymology. The origin of the postposition "-sake" "-hage," which must mean something like "collectivity /Gemeinsamkeit/" -- to express it in a nice abstract way -- remains to be elucidated. In the material recorded there is a verbal stem which is homonymic, but which no one would connect with the concept "collectivity": chopping wood! The work of the stone ax which splits the trunk. This is at any rate interesting, and one might believe that for a Karaiben the meaning "to chop wood, pieces of wood or sticks (collectivity), together, two" could develop divergently, even though our "zusammen, samt, sammeln /together, along with, to gather/," as well as the Sanscrit sama, Zend hama, English same, that is, derselbe /in Ger./, /418/ Greek ἁμά conjointly /zugleich/, ὁμός same /derselbe/, etc. have one origin. In this case the language would be the final missing link; it would furnish proof of the origin of the first number abstraction "2" from the concrete image of something broken and would thus complete the series of conclusions from my experiments, which

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802 196 reach back only to the proof of the origin from manual work, to make an uninterrupted chain of inductive evidence.

In Tupí "2" is mokõi, made up with the causative mo-; koi is translated "pair." Thus "2" = "makes pair." But what is koi? Now strangely enough, kopi -- the exact equivalent of the Bakaïrí sake -- means "to chop wood"! Between the two vowels in koi a softened consonant has been dropped; let us assume it arose from koui, kobi, which would be a very common process, and we would have the same origin of "2" as would be conceivable in Bakaïrí.

Finally I must also consider "tokále," "1." It is made up of "toka" and the augmentative particle "-le." "tõka" means "bow." Since each man has only one bow, or since many arrows go with one bow, the bow is the simplest example for "1" among all the implements. The derivation is a bit questionable because it is almost too perfect. To be sure, "toka" is so constructed phonetically that, according to the phonetic laws prevailing in the Bakaïrí, it need not change. It seems very striking that there are so few equivalents for "tokále" among the Karaiben of the north; they are fewer in number than those for "ahewão" and far fewer than those for "ahége." It is surely permissible to exclude coincidence here and to see in this circumstance, as regards language as well, evidence that actual, conceptual counting began with the "2."

II. Color Words

000 Available dyestuffs. Corresponding to the number of color words. Strange statements intelligible through etymology. Dyestuffs older than the need for color words. Use in connection with the names of animals and plants. Green never = blue-black.

196 Color words, no less than number words, show how development depends on interest.

191 386 As has already been mentioned, the following dyestuffs are used on the Schingú /Xingu/.